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SEARCH CHANNEL USE AND FIRMS' RECRUITMENT BEHAVIOUR***

BY

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Summary

In the present paper we examine the impact of firms' attitudes towards key aspects of the recruitment process on the number of search channels activated. Furthermore, we address the issue of the timing of the activation of additional search channels. It is found that firms that attach importance to search effort and to applicants' motivation generally use more search channels than firms that do not attach any importance to the aforementioned aspects of recruitment. Furthermore, it appears that employers generally use fewer search channels for permanent positions. However, firms with a personnel department which are hiring for a vacancy requiring specific work experience usually activate multiple search channels. Finally, the choice of advertising as the first search channel appears to negatively affect the chances of considering additional channels.

Key words: firm behaviour, search channels, vacancies, labour demand

1 INTRODUCTION

Employers invest a considerable amount of time and resources in the search for new employees. It requires much effort to identify and attract the applicants with the desired characteristics. Search and selection time spells may lead to the existence of a costly unfilled vacancy within a firm.

In the employers' search literature, most of the studies have considered issues related to vacancy duration[1] and the strategies firms may adopt in order to minimize this. In particular, this strand of literature has focussed on the use of search channels, sometimes in conjunction with the analysis of vacancy duration (Roper

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1 The vacancy duration, the length of the vacancy, is defined as the difference between the date the employer started to look for a new employee and the date the new employee was finally hired (Burdett and Cunningham (1998)).

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(1988), Lindeboom (1992), van Ours and Ridder (1992), Gorter et al. (1996), and Russo et al. (1997a)).

It has also been recognized that the choice of the search channels is of strategic importance in most staffing programmes; it may affect both the number of potential applicants and their expected productivity (and hence the value of the match between the vacant position and the eligible job seeker (Boudreau and Rynes (1985), Montgomery (1991)). However, only few studies have related the use of search channels to the characteristics of the hired applicant (Russo et al. (1997b), Holzer (1996)), or have investigated the role of personnel management in recruitment (Holzer (1987) and Russo et al. (1997a)).

In the present empirical analysis our aim is to further characterize the role of firms' attitudes in recruitment. To this end, we use an economic model based on sequential search that relates the choice of a certain strategy (in our case the number of search channels activated) to firms' attitudes towards some key aspects of the recruitment process. This is an important element in our empirical analysis; this new topic has received relatively little attention in the literature thus far.

Basically, there are two economic reasons that may induce employers to activate more search channels. First, employers may want to screen at least a certain number of candidates before making an employment offer (search at the extensive margin as described in Barron et al. (1985), Barron and Bishop (1985), and Barron et al. (1997)). In the case employers expect that none of the search channels alone will be able to provide the desired number of applicants[2] more search channels will be activated (quantity effect). Second, employers may prefer to screen different types of applicants (with different characteristics) before making an employment offer. In the event that search channels reach applicants with different characteristics (Kirnan et al. (1989)), employers may be keen on using more search channels to trigger applications from different types of job seekers (quality effect).

Of course, the likelihood that an employer wants to screen more or more types of applicants is heavily influenced by his/her attitude towards recruitment (Holzer (1987)). In fact, employers may have different attitudes towards the importance of certain aspects of recruitment such as the quality of the applicants, the cost of the recruitment procedure, the time spent recruiting, the compliance with the hiring standards, and last but not least, the level of effort to put into recruitment. In particular, employers with a higher propensity to put effort into recruitment may be willing to screen more applicants and to activate more search channels before making an employment offer. In the same vein, employers attaching more importance to applicants' motivation may be willing to screen more applicants and activate more search channels before making an employment offer. On the other hand, those employers wanting to fill the vacancy quickly or those unwilling to invest in the recruitment process may be less choosy about the quality (or quan-

2 The relevant segment in the labour market could be particularly tight.

tity) of the applicants. Consequently, these employers will probably activate fewer recruitment channels.

After these introductory remarks, we will introduce the employers' search model in section 2. This is followed by a description of the available data set in section 3. In section 4 the analytical tools are presented; a censored regression model and a Poisson model for the number of search channels to be activated. Section 5 will present the main results, whereas section 6 will offer some concluding remarks.

2 THE THEORETICAL FRAMEWORK

To find the right worker for a position within an organization is a lengthy procedure. From a demand side perspective the presence of vacancies implicitly signals the presence of uncertainty in recruitment. Employers are faced with uncertainty because they have imperfect information on the availability of job seekers and their associated productivity. To reduce the degree of uncertainty, employers may decide to put more effort into their search activity and to use screening and selection procedures to gather reliable information about applicants' productivity (search at the intensive margin, see Barron et al. (1985) and Barron and Bishop (1985)).

In what follows, firms are assumed to maximize profits by choosing their optimal search strategy on a per period basis (following customary dynamic optimization behaviour as outlined in Lippman and McCall (1976)).

Each period, applicants are assumed to arrive according to a Poisson process at a rate (known to the firm) that depends on the total number of job seekers and the total number of open vacancies. Conditional upon arrival, every applicant is a random draw from a known probability distribution. The applicant's productivity is not directly observable but it can be approximated by easily observable characteristics like educational level, years of experience, and the worker's age. During the search activity employers may be able to influence the rate of arrival of applicants[3] by varying the number of search channels used. Search channels reach different populations of job seekers (Kirnan et al. (1989)) and can be characterized by different rates of arrival of applicants (Russo et al. (1995)). Employers activate a search channel by allocating search effort to it and by paying the associated cost. The optimal number of search channels activated is given by the condition that the marginal cost from opening an additional search channel is

3 In what follows we will assume sequential search. It has been argued that during recruitment employers may actually be using non-sequential search strategies (van Ours and Ridder (1991), van Ours and Ridder (1992), van Ours and Ridder (1993), and Gorter and van Ommeren (1999)). Van Ours and Ridder (1993) find an average application period of 3.1 weeks and a mean selection period of 14.6 weeks. However, the average duration in our data set is 5.5 weeks and the median duration is 4 weeks only. Short vacancy duration suggests that employers are less likely to have used non-sequential search.

equal to the marginal benefits, which are determined by the product of the marginal increment in the applicants' arrival rate due to the activation of one additional search channel times the average acceptance probability. If search costs are equal across channels, employers will activate search channels in such a way as to equate the marginal benefits from search across search channels.

Of course, firms' attitude towards recruitment will also play a role. Firms that regard effort as an important aspect in recruitment may be willing to invest relatively more in the search activity and to activate more search channels. Firms that deem the speed in providing applicants as important would tend to activate those search channels characterized by a high rate of arrival of applicants, regardless of the type of applicant these search channels reach. Again, cost-sensitive employers would rather make use of less expensive search channels. Furthermore, those firms that consider it important to approach only the right applicants would then select those search channels that best reach the selected target population of job seekers.

Employers maximize the expected present value of the flow of profits in a stationary environment, the optimal search strategy can be characterized by a constant reservation level of productivity[4] (Fallick (1992)) and by an optimal number of search channels to be activated (per period, denoted by *sc*). Employers will then hire the first applicant whose productivity is higher than the reservation level of productivity.

The optimal choice of the number of search channels to activate and of the reservation productivity (to be made each period) jointly determines the likelihood that an applicant is hired for the position concerned[5] (the hazard rate, Lancaster (1992)). The probability of filling a vacancy (θ) can be written as follows:

$$\theta = \mu(sc)\, p(\xi)\,, \tag{1}$$

where μ is the rate of arrival of job seekers, which is a function of the search channels activated in the period (*sc*), and p is the acceptance probability, which depends on the reservation productivity (ξ).

To summarize, each period firms choose the optimal reservation level of productivity and set the optimal number of search channels. This process determines the probability to fill vacancy. In turn, this determines the total vacancy duration (T). At the end of the recruitment process the firm would have activated $SC(T)$ different search channels.[6]

4 Van Ours and Ridder (1991) find that educational requirements are not lowered as the vacancy duration lengthens. This result is compatible with a constant reservation level of productivity.

5 In this partial equilibrium approach, it is usually assumed that the applicants reacting to a vacancy notification are also willing to accept the job if an offer is tendered.

6 We implicitly assume that once a search channel has been activated it remains active for the rest of the recruitment process.

Of course, both the number of search channels activated ($SC(T)$), and the reservation productivity (ξ) vary across firms and across types of jobs (heterogeneous firms and jobs).

In this framework employers choose their recruitment methods (which and how many search channels to use) at the beginning of the recruitment procedure; if the vacancy is not filled by the end of the period, next period recruitment begins again with the same optimal search strategy. Employers may choose a different search strategy if, for example, some of the structural parameters change. To allow for a switch to an alternative search strategy, the model needs either a learning process (the introduction of learning in a job search model and the conditions under which this learning process leads to a decreasing reservation wage are stated in Burdett and Vishwanath (1988)) or the introduction of non-stationarity in the structural parameters (the rate of arrival is then time-dependent due to source exhaustion, as shown for job search models in van den Berg (1990).[7]

The model as specified here is very general; employers may activate one search channel at the time, more search channels simultaneously, or use a package of more search channels sequentially (one package after the other)[8]; the actual timing would depend on the characteristics of the search channels involved (see Gorter and van Ommeren (1999)).

In our empirical application, we use data on filled vacancies (completed spells of duration). For each filled vacancy we know: (*i*) the total number of (different) search channels used during the recruitment period ($SC(T)$) and (*ii*) background vacancy and firm characteristics. These two sets of variables will support the empirical part of this paper.

3 THE DATA SET

Our data set originates from as survey on employers' recruitment behaviour held in 1986 in the Netherlands and consists of 763 filled vacancies[9] (745 after correcting for missing data and wrong or impossible answers). In the survey, firms were asked about their recruitment behaviour with reference to their last vacancy filled. The survey contains information on firms' recruitment behaviour, such as: the first recruitment channel used, the number of recruitment channels activated, the actual hiring channel[10], and the vacancy duration, together with vacancy characteristics (educational level required, experience required) and firm characteris-

7 The implementation of a theoretical non-stationary search model describing the timing in the activation of recruitment channels (as in Gorter and van Ommeren (1990)) is beyond the scope of this paper.

8 The functioning of different recruitment channels has been thoroughly investigated in Gorter et al. (1996) and Gorter and van Ommeren (1999). Van Ours (1994) paid special attention to the functioning of the labour exchange office.

9 The survey represents a flow sample of filled vacancies, see Lancaster (1992).

10 The hiring channel is the search channel that produced the hired applicant.

tics (such as size, economic sector, personnel department, etc.). Moreover, firms were asket about the importance of certain key aspects of recruitment (such as costs, generating motivated applicants, generating the right applicants, speed in providing applicants, and the effort). Further information on the definition of the firms' attitudes towards recruitment variables can be found in Appendix A1.[11]

The survey contains extensive information on the use of search channels; in particular the first search channel activated and the search channel that in the end became the hiring channel are reported. In the sample the average number of channels activated is 1.84 (51% of the firms in the sample activated only one search channel). Table 1 offers relevant descriptive statistical information on the use of search channels. The data set distinguishes between 11 different channels; but, for the sake of convenience, we have clustered the search channels into five

TABLE 1 – DESCRIPTIVE STATISTICS ON THE ACTIVATION OF SEARCH CHANNELS

	Frequency	Percentage	Average duration	Average number of channels
First channel activated				
Informal	294	39.5	5.2	2.0
Advertisement	251	33.7	6.1	1.5
Labour exchange office	130	17.6	5.1	2.2
Temporary placement office	28	3.6	5.7	2.1
Others	42	5.6	7.6	2.1
Total	745	100.0	5.6	1.8

				First channel				
Number of channels activated	Frequency	Percentage	Average duration (in weeks)	Informal	Advert.	LEO	TPO	Others
1	380	51.0	4.9	127	168	54	14	21
2	193	25.9	6.2	90	55	33	4	6
3	106	14.2	6.5	48	21	25	6	7
4	37	5.1	7.5	18	3	8	3	5
5	29	3.8	6.3	11	4	10	1	3
Total	745	100.0	5.6					

11 Moreover, the list of variables used in the empirical analysis can be found in Appendix A2. The associated descriptive statistics are given in Appendix A3.

groups: Informal channel,[12] Advertisement, Labour Exchange Office (LEO), Temporary Placement Office (TPO), and the residual category Others. The first part of Table 1 provides some useful information on the way recruitment channels operate. It appears that the informal channel, LEO and TPO tend to behave in a similar way; they involve an average duration of about 5 weeks and the average number of recruitment channels used is around 2. The only channel that seems to show a different behaviour is advertisement; in this case the average duration is somewhat longer, 6 weeks, whilst the average number of search channels activated is lower (1.5). Notice that as the number of search channels activated increases the duration of the recruitment process increases as well. In other words, longer recruitment processes tend to be associated with the use of more search channels (in fact, the correlation coefficient $\rho = 0.12$ is significant at 5%).

Another interesting aspect regards the effectiveness of search channels in filling vacancies; that is, the number of times recruitment channel activated also becomes the hiring channel. The statistics about the effectiveness of search channels are put together in Table 2.

It can be seen that, in line with the results in the literature (Lindeboom (1992), Gorter et al. (1993), Russo et al. (1997a)), there are striking differences among recruitment channels with advertising being the most effective (in 91% of the cases advertisement is activated as the first search channel and it also becomes the hiring channel) and LEO being the least effective.[13] Advertisement's high effectiveness may arise from the fact that advertising is a search channel that is often used in isolation. The lower panel of Table 2 shows that advertisement remains the most effective search channel in filling vacancies also when more search channels are activated. These differences in the search channels' performance strongly suggest that it may also be appropriate to estimate the empirical model controlling for employers' initial choice of the recruitment channel.

Firms' attitudes towards certain aspects of recruitment may disclose firms' propensity to search actively in the recruitment process. In particular, firms considering effort an important aspect of recruitment may search more actively for candidates.

Table 3 summarizes the relationship between firms' attributes towards recruitment and the duration of the recruitment process and the number and type of search channels activated. Clearly, firms that consider effort an important aspect of recruitment (effort = 1) tend to activate more search channels and tend to search longer than firms that do not. On the contrary, the frequency of activation of the first search channel does not seem to differ from what happens in the whole

12 It includes the use of friends and relatives, the use of incumbent workers, and the use of open applications (Rees (1966)).

13 It is important to point out that Lindeboom (1992) found that advertisement and informal channels are most effective in matching employed job seekers, while LEO is the worst in this respect. The conclusion may change when an unemployed job seeker has to be matched. In this case, the most effective channel turns out to be LEO.

TABLE 2 – CHANNELS' EFFECTIVENESS IN MATCHING VACANCIES AND JOB SEEKERS

The whole sample First channel	Hiring channel					
	Informal	Advertisement	LEO	TPO	Others	Total
Informal	190	76	20	4	4	294
	65.0	25.7	6.5	1.4	1.4	39.5
Advertisement	17	228	2	2	2	251
	6.8	90.8	0.8	0.8	0.8	33.7
LEO	16	32	74	7	2	130
	11.5	24.6	57.0	5.4	1.5	17.4
TPO	1	5	–	22	–	28
	3.7	18.5	–	77.8	–	3.8
Others	5	6	1	1	29	42
	11.9	14.3	2.4	2.4	69.0	5.6
Total	229	347	96	35	37	745
	30.7	47.0	12.9	4.7	4.7	100

Subsample: Number of search channels activated > 1

First channel	Hiring channel					
	Informal	Advertisement	LEO	TPO	Others	Total
Informal	63	76	20	4	4	167
	37.7	45.5	12.0	2.4	2.4	46.3
Advertisement	17	60	2	2	2	83
	20.5	72.3	2.4	2.4	2.4	23.0
LEO	16	32	19	7	2	76
	21.0	42.1	25.0	9.2	2.6	21.0
TPO	1	5	–	8	–	14
	7.1	35.7	–	57.1	–	3.9
Others	5	6	1	1	8	21
	23.8	28.6	4.8	4.8	38.1	5.8
Total	102	179	42	22	16	361
	28.3	49.6	11.6	6.1	4.4	100

population (Informal: 39%, Advertisement: 35%, LEO: 17%, TPO: 3.3%, Others: 5.7%).

The same result holds true for those firms considering applicants of good quality an important aspect of the recruitment process. Firms that consider low costs as an important characteristic of the recruitment process (Cost = 0) however, tend to rely more on the use of informal search channels and less on the use of ad-

TABLE 3 – FIRMS' ATTITUDES TOWARDS RECRUITMENT AND THE NUMBER AND TYPE OF SEARCH CHANNELS ACTIVATED

		Average number of channels used	Average duration (weeks)	First channel activated				
				Informal	Advert.	LEO	TPO	Others
Effort	1	1.9	6.0	211	191	92	18	29
	0	1.7	4.0	83	60	38	10	13
Cost	1	1.9	6.2	170	177	80	18	23
	0	1.8	4.2	124	74	50	10	19
Motivation	1	1.9	5.5	279	244	123	27	42
	0	1.5	4.0	15	7	7	1	0
Fast	1	1.8	5.0	206	193	103	21	26
	0	1.9	6.9	88	58	27	7	16
Right	1	1.9	5.8	268	244	112	25	39
	0	1.8	2.0	26	7	18	3	3

vertisement than firms that consider low costs an unimportant (Cost = 1) characteristic of the recruitment process (see also Russo et al. (1997a)).

4 THE ECONOMETRIC MODELS USED

To empirically model the number of search channels used in recruitment, we will use an ordered regression model (a variant of an ordered response model). The number of search channels activated and the reservation productivity are directly linked to the importance of the vacant position for the firm. The higher the cost of a mistake in recruitment, the more careful the firm will recruit. At the beginning of the recruitment procedure, employers activate the optimal combination of search channels. The total number of different search channels activated ($SC(T)$) then results from the repeated solution of the optimization problem sketched in section 2. In a reduced-form approach, one can postulate that the number of search channels activated is the observable realization of an unobservable latent variable Y that reflects the optimal search investment, and that is influenced by

the value of the vacancy. The higher this value the higher the search activity at both the intensive and extensive margins (Mortensen (1986)) and the more search channels are activated. Next, the latent variable Y can be thought of as a function of exogenous variables:

$$Y = Y(X) + \epsilon \tag{2}$$

where X is the set of explanatory variables (vacancy and firm characteristics), and ϵ is the error term. In case we adopt a linear expression for Y, equation (2) becomes:

$$Y = X'\beta + \epsilon\,, \quad \epsilon \sim N(0, \sigma^2) \tag{3}$$

where β is a vector of parameters to be estimated. Moreover, we assume that ϵ is distributed according to a normal distribution. Y is unobserved, but for each firm we can observe the limited dependent variable $SC(T)$ which is related to Y. In our case we will follow Rietveld and Gorter (1990),[14] so that:

$$\begin{aligned} &SC(T) \leq 1 \text{ if } Y < 1.5 \\ &SC(T) = 2 \text{ if } 1.5 \leq Y < 2.5 \\ &SC(T) = 3 \text{ if } 2.5 \leq Y < 3.5 \\ &SC(T) = 4 \text{ if } 3.5 \leq Y < 4.5 \\ &SC(T) \geq 5 \text{ if } 4.5 \leq Y\,. \end{aligned} \tag{4}$$

The corresponding likelihood function (L) reads as follows:

$$\begin{aligned} L = &\prod_{SC(T) \leq 1} \Phi\left(\frac{1.5 - x\beta}{\sigma}\right) * \prod_{SC(T) = 2} \left[\Phi\left(\frac{2.5 - x\beta}{\sigma}\right) - \Phi\left(\frac{1.5 - x\beta}{\sigma}\right)\right] * \\ &\prod_{SC(T) = 3} \left[\Phi\left(\frac{3.5 - x\beta}{\sigma}\right) - \Phi\left(\frac{2.5 - x\beta}{\sigma}\right)\right] * \\ &\prod_{SC(T) = 4} \left[\Phi\left(\frac{4.5 - x\beta}{\sigma}\right) - \Phi\left(\frac{3.5 - x\beta}{\sigma}\right)\right] * \\ &\prod_{SC(T) \geq 5} \left[1 - \Phi\left(\frac{4.5 - x\beta}{\sigma}\right)\right] \end{aligned} \tag{5}$$

14 Note that this model collapses into a 2-limit probit model as described in Maddala (1985) when we would take the values between 1 and 5 as one single category.

This model is closely linked to an ordered probit model (Maddala (1985)). It is a very general model since it does not impose a structure on the timing of the opening of additional search channels. On the other hand, our data strongly suggest that search channels are activated sequentially. Information on the timing of the activation of auxiliary search channels is available only for those firms that filled the vacancy via a search channel that is different from the first search channel activated (200 observations, 53% of the firms using more than one search channel). Of these firms, 97% reported a positive duration between the time of activation of the first search channel and the time of activation of the search channel that would eventually become the hiring channel.

To analyze the activation of additional search channels over time we have estimated a Poisson model. The Poisson model is a model to count random events that occur independently in any fixed time interval. It gives the probability that n events occur in the time interval of length t (Cameron and Trivedi (1998)). Every time a search channel is activated, we will observe an arrival. The basic Poisson probability specification is:

$$pr(n) = e^{-\lambda}\frac{\lambda^n}{n!} \tag{6}$$

where n is the number of occurrences, and λ is the parameter of the process. In our case, n is the number of additional search channels used by the employers while seeking for new employees (the number of different recruitment channels activated minus one, $SC(T)) - 1$). The model exhibits the well known limitation that the mean and the variance of the distribution are equal. In the present paper we will adopt a generalization of the Poisson process that will allow the parameter λ to depend on time (see Gorter (1991), van Ours and Ridder (1992), and Lancaster (1992)). This approach has been chosen, since the observation interval is not fixed. In fact, for each firm we observe the number of channels opened during a time period corresponding to the vacancy duration. The general expression for the probability of n arrivals within time T (the vacancy duration) is given in equation (7).

$$pr(n_T) = \frac{\left(\int_0^T \lambda(t)\,dt\right)^n}{n!} e^{-\int_0^T \lambda(t)\,dt} \tag{7}$$

In the model to be estimated we will adopt the following specification for $\lambda(t)$:

$$\lambda(t) = e^{x\beta + \alpha_1 d_1(t) + \alpha_2 d_2(t) + \alpha_3 d_3(t) + \alpha_4 d_4(t)(T-3)}, \tag{8}$$

where $d_i(t)$ is a dummy variable equal to 1 if the vacancy concerned is still open in the time interval considered (thus $d_i(t) = 1$ if $t > i$; otherwise $d_i(t) = 0$). We will consider in our analysis four time intervals; $i = 1, 2, 3, 4$ indicates the first week, the second week, the third week and more than three weeks, repectively.

5 EMPIRICAL RESULTS

In this section we present the results of the estimations carried out. We begin with the estimates concerning the ordered regression models for the total number of search channels activated. The results are presented in Table 4. As far as firms' attitudes towards the aspects of the recruitment process are concerned, it apprears that employers who consider the effort in recruitment as important generally use more search channels than employers who do not. This result may indicate that firms considering effort an important aspect of recruitment, *ceteris paribus*, search more actively and, consequently, are more likely to activate more search channels. The same pattern is also found when comparing the number of search channels activated by firms that consider applicants' motivation as an important aspect of the recruitment process to those that do not. The results on the effect of the firms' attitudes towards aspects of the recruitment process on the number of search channels activated are not spurious, that is, they are not mediated by the choice of the first search channel activated. In fact, the parameters of motivation and effort remain virtually unchanged after the inclusion of the first search channel activated among the independent variables. In addition, it appears that when a permanent position has to be filled, fewer search channels are opened. This seems an odd result, but it could, in fact, be due to a supply side phenomenon; permanent positions usually attract more applicants, so that the rate of arrival of applicants tends to remain high for a long period, thus decreasing the incentive to activate additional search channels.

Furthermore, firms in the personal service sector appear to use fewer search channels when compared to firms in the business service sector. This result is partially due to the correlation with the use of the first search channel. In fact, after the addition of the first search channel activated the effect of being in the personal services sector decreases by about 30%, but it still remains significant. Again this may be a supply side effect due to the increase in (female) labour force participation.

The choice of the first search channel is also of importance for the course of recruitment; essentially, it appears that the initial choice of one of the highly effective search channels (advertisement) substantially reduces the chances of observing the use of additional search channels (confront this outcome *versus* the overall rate of success shown in Table 2).

Second, to explore the rate of activation of additional search channels we have estimated a Poisson regression model, the dependent variable is thus the number of additional search channels activated ($SC(T)$-1). We started with the estimation

TABLE 4 – ORDERED REGRESSION ESTIMATES OF THE TOTAL NUMBER OF SEARCH CHANNELS ACTIVATED $SC(T)$ (STANDARD ERRORS IN PARENTHESES; * SIGNIFICANT AT 5%)

Dependent variables	# of search channels used $SC(T)$	# of search channels used $SC(T)$
Independent variables		
constant	1.43 (0.54)*	1.23 (0.52)*
Firms' attitude towards recruitment		
effort	0.34 (0.20)*	0.33 (0.15)*
motivation	0.69 (0.38)*	0.71 (0.35)*
speed	− 0.13 (0.17)	− 0.06 (0.16)
cost	− 0.01 (0.40)	− 0.08 (0.14)
right	0.04 (0.45)	0.18 (0.26)
Vacancy characteristics		
Permanent	− 0.50 (0.19)*	− 0.37 (0.17)*
full-time	− 0.27 (0.22)	− 0.21 (0.19)
Required education		
high	− 0.41 (0.38)	− 0.36 (0.29)
second	− 0.30 (0.33)	− 0.23 (0.25)
low vocational	− 0.40 (0.28)	− 0.44 (0.23)*
Experience required		
specific	0.15 (0.16)	0.29 (0.15)*
non-specific	− 0.08 (0.25)	− 0.01 (0.15)
age restriction	0.08 (0.15)	0.14 (0.13)
Firm's characteristics		
personnel dept.	0.26 (0.16)	0.19 (0.15)
large	0.33 (0.21)	0.36 (0.18)*
medium	− 0.14 (0.18)	− 0.02 (0.12)
manufacturing	− 0.08 (0.27)	− 0.10 (0.17)
construction	− 0.07 (0.25)	− 0.19 (0.19)
personal services	− 0.51 (0.23)*	− 0.36 (0.19)*
standard deviation (σ)	1.54 (0.07)*	1.48 (0.07)*
First recruitment channel		
informal		− 0.08 (0.24)
advertisement		− 0.95 (0.25)*
LEO		0.27 (0.26)
# of observation	745	745
Log likelihood	− 907.969	− 883.853

Reference groups of the exogenous variables are given in parentheses: required education (primary), size of the firm (small), sector of the firm (services), personnel department (no personnel department), required experience (no experience), age restriction (no age restriction), permanent position (temporary), full-time job (part-time job), first recruitment channel (others).

of a Poisson model on the total sample (not including the first search channel activated among the explanatory variables: the pooled model). Then the same model has been estimated for each search channel separately, these latter results must be interpreted as conditional on the choice of the first search channel.[15] The estimates of the effects of the explanatory variables on the rate of additional search channels are presented in Table 5. Let us begin with the pooled model (model 1). As far as the variables referring to firms' attitudes during recruitment are concerned, it appears that firms that consider effort and applicants' motivation important aspects of the recruitment process have a higher probability of activating additional search channels.

Moreover, it appears that firms are less likely to open additional search channels when hiring for permanent and full-time positions, requiring high educational levels. This could again be a supply side phenomenon, good positions usually attract many applicants; consequently, the rate of arrival of applicants relative to the search channel activated would decline very slowly. In this case the likelihood of considering the activation of additional search channels may drop.

The presence of a personnel department appears to increase the probability of opening auxiliary search channels during the recruitment process (and this is particularly true when advertisement is the first search channel activated). This effect may be linked to the higher capability in screening and selecting personnel departments offer, firms may be willing to receive more applicants, with different characteristics. In this event, the likelihood of considering the activation of different search channels would increase.

A last remark concerns the robustness of our findings. In fact, the significant effects in the Poisson model (timing in the activation of search channels) correspond to those found in the ordered regression model (activation of the total number of search channels) even though the structure of the two empirical models is quite different.

If we turn to the time pattern, there seems to be a negative time dependency; that is, as time elapses, the chance to observe the opening of a new search channel decreases. If the vacancy remains open for more than three weeks, then it is almost certain that no additional search channels will be opened. It seems that active recruitment takes place at the beginning of the duration spell. In fact, a somewhat higher chance to observe an opening is formed for the third week, then as the duration spell becomes longer, active recruitment turns into a waiting strategy: a passive recruitment. Search channels are activated during the first few weeks in order to reach enough applicants, while the rest of the vacancy duration is used to hire one of the applicants.

So far, we have not allowed for search channel specific effects; to take these into consideration we will discuss the search channel specific models (Models 2,

15 We also estimated ordered regression models for each search channel separately. The results are similar to those presented in Table 5 (available by the authors upon request).

TABLE 5 – EFFECTS ON THE RATE OF ACTIVATION OF ADDITIONAL SEARCH CHANNELS ($\lambda(t)$) (STANDARD ERRORS IN PARENTHESES; * SIGNIFICANT AT 5%)

Variables	Model 1 (Pooled model)	Model 2 Informal	Model 3 Adv.	Model 4 TPO + Others + LEO
Firms' attitude towards recruitment				
effort	0.22 (0.11)*	0.16 (0.17)	0.21 (0.26)	0.26 (0.16)
motivation	0.77 (0.29)*	0.80 (0.44)*	0.42 (0.64)	0.35 (0.50)
speed	− 0.09 (0.10)	− 0.12 (0.14)	− 0.14 (0.26)	0.27 (0.18)
cost	0.08 (0.10)	− 0.15 (0.14)	0.28 (0.23)	0.03 (0.15)
right	− 0.12 (0.20)	− 0.13 (0.27)	1.05 (1.06)	− 0.26 (0.27)
Vacancy characteristics				
Permanent	− 0.48 (0.11)*	− 0.44 (0.16)*	− 0.61 (0.30)*	− 0.02 (0.24)
full-time	− 0.23 (0.12)	− 0.05 (0.18)	0.08 (0.30)	− 0.49 (0.21)*
Required education				
high	− 0.57 (0.19)*	− 0.40 (0.29)	− 1.18 (0.46)*	− 0.41 (0.31)
second	− 0.40 (0.17)*	− 0.38 (0.26)	− 0.70 (0.35)*	− 0.29 (0.26)
low vocational	− 0.40 (0.15)*	− 0.40 (0.23)	− 0.69 (0.35)*	− 0.45 (0.23)*
Experience required				
specific	0.07 (0.10)	0.17 (0.15)	− 0.10 (0.26)	0.34 (0.17)*
non-specific	− 0.05 (0.14)	0.14 (0.22)	− 0.47 (0.39)	0.27 (0.23)
age restriction	0.01 (0.16)	0.32 (0.13)*	− 0.45 (0.20)*	0.09 (0.14)
Firm's characteristics				
personnel dept.	0.21 (0.09)*	0.05 (0.15)	0.65 (0.23)*	0.24 (0.18)
large	0.19 (0.13)	0.38 (0.19)*	− 0.45 (0.31)	0.33 (0.21)
medium	− 0.09 (0.12)	0.21 (0.18)	− 0.29 (0.25)	− 0.14 (0.18)
manufacturing	− 0.03 (0.10)	− 0.10 (0.17)	− 0.11 (0.26)	0.03 (0.20)
construction	0.07 (0.12)	− 0.04 (0.19)	− 0.35 (0.32)	0.28 (0.20)
personal services	− 0.45 (0.12)*	− 0.20 (0.18)	− 0.77 (0.26)*	− 0.07 (0.25)
Time pattern				
first week	− 0.47 (0.36)	− 0.89 (0.56)	− 0.95 (1.26)	− 0.62 (0.63)
second week	− 2.85 (1.96)	− 1.72 (0.84)*	− 2.56 (3.03)	− 1.04 (0.78)
third week	− 1.11 (0.47)*	− 2.51 (1.65)	− 2.90 (3.01)	
more than three weeks	− 3.46 (0.58)*	− 3.05 (0.74)*	− 3.28 (1.45)*	
more than two weeks				− 4.33 (1.44)*
Log likelihood	− 897.124	− 359.518	− 222.694	− 275.828
# of observations	745	294	251	200

Reference groups of the exogenous variables are given in parentheses: required education (primary), size of the firm (small), sector of the firm (services), personnel department (no personnel department), required experience (no experience), age restriction (no age restriction), permanent position (temporary), full-time job (part-time).

3, and 4). We will begin with the informal channel. A very interesting result relates to the size of the firm. Apparently, large firms have an incentive to open additional search channels when the informal channel is the first search channel activated (Model 2). The same holds true when there are age restrictions. The results gain in importance when they are compared to the bahaviour of the rate of arrival of additional search channels when advertisement is the first search channel activated (Model 3). One of the first things to be noticed is the role of educational requirements. Here they have a negative effect on the rate of arrival of additional search channels (note that when the informal channel is the first recruitment channel, educational requirements are not significant). The same is true when there are age restrictions. The size of the firm does not appear to be significant, but the sign of the effect is negative (it is positive when the informal channel is the first search channel activated). All these observations together may give rise to the following interpretation of how advertisement functions. Educational requirements and age restrictions have a negative effect on the chance that a second channel is opened; this may be due to the fact that advertisement is the recruitment channel that gives more space for the job-related information in the initial phase of recruitment, so that potential candidates are exposed to self-selection before applying for the vacant position concerned. In other words, one may expect that self-selection among applicants is the advantage of using advertisements, while the advantage of the informal channel may stem from its capacity to screen candidates on the grounds of their ability. The negative sign for the size effect (although not significant), may be due to the fact large firms are able to use the hiring standards as screening devices more efficiently than smaller firms (see Oosterbeek and van Praag (1993)), so that they rely on advertisement more often.

6 CONCLUSIONS

The empirical analysis conducted in this paper highlights an important feature of firms' recruitment behaviour. To the extent that firms differ in their attitudes towards certain aspects of the recruitment process (heterogeneity) they will choose different recruitment strategies. Firms will choose to activate different numbers of search channels as empirically shown in the present paper.

The empirical analysis reveals the following empirical regularities:

Firms considering effort an important aspect of the recruitment process are, *ceteris paribus*, more likely to activate multiple search channels. This effect also persists after controlling for the effect of the first search channel activated;

Firms considering applicants' motivation an important aspect of recruitment tend to activate relatively more search channels. Again, this result persists when we control for the effect of the first search channel activated.

These outcomes are consistent with the notion that firms searching more actively are, *ceteris paribus*, more likely to use additional search channels.

To summarize our results, it appears that firms differ in the degree of importance they attach to certain aspects of the recruitment process. This form of heterogeneity, usually neglected in other empirical analysis because of lack of information, has nonetheless important effects on the choice of the number of search channels to activate during the recruitment process.

APPENDIX A1 – FIRMS' ATTITUDE TOWARDS CERTAIN ASPECTS OF THE RECRUITMENT PROCESS

The firm's attitude towards certain aspects of the recruitment process is derived from the evaluation of the following set of 5 statements:

1) The recruitment process should not be expensive
2) The recruitment process should not cause much work
3) The recruitment process should deliver motivated applicants
4) The recruitment process should deliver applicants quickly
5) The recruitment process should deliver the right applicants

Employers could agree or disagree with each of these statements. From these statements we generated the following five dummy variables:

Cost: equal to 1 if the employer *disagrees* with statement 1, and zero otherwise;
Effort: equal to 1 if the employer *disagrees* with statement 2, and zero otherwise;
Motivation: equal to 1 if the employer *agrees* with statement 3, and zero otherwise;
Fast: equal to 1 if the employer *agrees* with statement 4, and zero otherwise;
Right: equal to 1 if the employer *agrees* with statement 5, and zero otherwise.

The set of five statements was placed at the very beginning of the interview and employers had no way of knowing that the following questions would address the last vacancy filled. Consequently, it could happen that employers disagreeing with statement 2 did not put much effort in the recruitment process for their last vacancy filled because the vacancy had been really easy to fill.

In Table A1 the correlation coefficients between the five dummies are presented.

TABLE A1 – CORRELATION COEFFICIENTS BETWEEN FIRMS ATTITUDES TOWARDS RECRUITMENT (*: SIGNIFICANT AT 5%)

	Effort	Motivation	Fast	Cost	Right
Effort	1				
Motivation	− 0.06	1			
Fast	− 0.20*	0.23	1		
Cost	0.32*	− 0.12*	− 0.22*	1	
Right	0.04	0.17*	0.09*	− 0.01	1

APPENDIX A2 – LIST OF VARIABLES

Duration: duration of the recruitment process, in days.
Lndur: logarithm of duration.
TRC: number of search channels activated.
Effort: see Appendix A1.
Motivation: see Appendix A1.
Cost: see Appendix A1.
Fast: see Appendix A1.
Right: see Appendix A1.
Pers. dept.: dummy variable = 1 if a firm has a personnel department.
Large: dummy variable = 1 if a firm has more than 100 employees.
Medium: dummy variable = 1 if a firm has more than 10 and less than 100 employees.
Small: dummy variable = 1 if a firm has less than 50 employees.
Manufacturing: dummy variable = 1 if firms operate in one of the following industries: Agriculture [ISIC 1], Mining [ISIC 2], Manufacturing [ISIC 3], Utilities [ISIC 4].
Services: dummy variable = 1 if firms operate in one of the following industries: Business services (Finance and insurance and real estate and business services) [ISIC 8], Restaurant and hotels and trade [ISIC 6], Transport and communication [ISIC 7].
Personal services: dummy variable = 1 if firms operate in the following industry: Community and social and personal services [ISIC 9].
Construction: dummy variable = 1 if firms operate in the following industry: Construction [ISIC 5].
Primary: dummy variable = 1 if Minimal educational level required is primary education.
Low vocational: dummy variable = 1 if Minimal educational level required is secondary vocational.

Second: dummy variable = 1 if Minimal educational level required is secondary general.
High: dummy variable = 1 if Minimal educational level required is university of comparable vocational level.
No-experience: dummy variable = 1 if no working experience is required.
Specific: dummy variable = 1 if specific working experience is required.
Non-specific: dummy variable = 1 if non-specific working experience is required.
Age restriction: dummy variable = 1 if an age limit is imposed.
Full-time: dummy variable = 1 if hiring concerns a full-time position (more than 30 hours per week).
Permanent: dummy variable = 1 if the vacancy concerns a permanent position.

APPENDIX A3 – DESCRIPTIVE STATISTICS OF THE VARIABLES USED

Variable	Mean	Std. Dev.
Duration	5.48	6.62
Lndur	1.28	0.89
TRC	1.84	1.09
Effort	0.73	0.45
Motivation	0.96	0.20
Fast	0.74	0.44
Cost	0.37	0.48
Right	0.92	0.27
Pers. dept.	0.45	0.50
No-exp.	0.28	0.45
Specific	0.58	0.49
Non-spec.	0.13	0.34
Permanent	0.84	0.37
Full-time	0.84	0.37
Age restriction	0.51	0.50
Primary	0.09	0.29
Low vocational	0.45	0.50
Second	0.31	0.46
High	0.16	0.36
Medium	0.39	0.49
Large	0.33	0.47
Small	0.28	0.45
Manufacture	0.23	0.42
Construction	0.21	0.41
Pers. serv.	0.27	0.44
Services	0.30	0.46

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